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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
			EXAMINER	
			MALDONADO, JULIO J	
			ART UNIT	PAPER NUMBER
			2823	
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			07/02/2007	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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## Office Action Summary

Application No.

10/523,974

Applicant(s)

FURUYA ET AL.

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 May 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 February 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>02/08/2005</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of claims 1-17 in the reply filed on 05/02/2007 is acknowledged. The traversal is on the ground(s) that "...the subject matter of all claims 1-18 is sufficiently related that a thorough search for the subject matter of any one group of claims would necessarily encompass a search for the subject matter of the remaining claims...". This is not found persuasive because there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification and a different field of search and accordingly there is a burden on the examiner if the restriction is not required.

The requirement is still deemed proper and is therefore made FINAL.

### ***Information Disclosure Statement***

2. The information disclosure statement filed 04/18/2006 fails to comply with 37 CFR 1.98(a)(1), which requires the following: (1) a list of all patents, publications, applications, or other information submitted for consideration by the Office; (2) U.S. patents and U.S. patent application publications listed in a section separately from citations of other documents; (3) the application number of the application in which the information disclosure statement is being submitted on each page of the list; (4) a column that provides a blank space next to each document to be considered, for the examiner's initials; and (5) a heading that clearly indicates that the list is an information

disclosure statement. The information disclosure statement has been placed in the application file, but the information referred to therein has not been considered.

***Drawings***

3. Figure 7 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

4. The disclosure is objected to because of the following informalities: in page 16, line 27, where applicants recite, "...will be give...", change to --will be given--.

Appropriate correction is required.

***Claim Objections***

5. Claim 8 is objected to because of the following informalities: In claim 8, line 3, where applicants recite, "...temperature sufficiently higher than the process...", change to --temperature higher than the process--. Appropriate correction is required.

6. Claim 12 is objected to because of the following informalities: In claim 12, line 18, where applicants recite, "...sufficiently higher than the process...", change to --higher than the process--. Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-7 and 9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Mizuno et al. (U.S. 5,728,629, hereinafter Mizuno).

In reference to claim 1, Mizuno teaches a method of forming a conductive layer over a substrate including the steps of controlling temperature of a first substrate to be at a process temperature inside a process container (Mizuno, column 8, lines 18 – 26), while supplying a process gas into the process container, thereby subjecting the first substrate to a semiconductor process, during which a by-product film is formed on an inner surface of the process container (Mizuno, column 6, lines 20 – 37); subsequently to the semiconductor process and unload of the first substrate out of the process container, supplying a reforming gas into the process container, thereby subjecting the by-product film to a reformation process (Mizuno, column 6, lines 20 – 37); and subsequently to the reformation process, controlling temperature of a second substrate to be at the process temperature inside the process container, while supplying the process gas into the process container, thereby subjecting the second substrate to the semiconductor process (Mizuno, column 7, lines 32 – 43).

Mizuno fails to expressly disclose wherein said reformation process is set to reduce thermal reflectivity of the by-product film. However, Mizuno teaches wherein the

reformation process comprises an oxidation of the titanium nitride by-product (Mizuno, column 7, lines 23 – 31). Furthermore, in page 22, lines 6 – 22 of the disclosed specification, applicants teach, "...The oxygen thus supplied into the inner tube 3 is activated by heat inside the process container 2, and oxidizes the by-product film deposited inside the process container 2 and containing titanium nitride as the main component. As a consequence, the by-product film is reformed into a film containing titanium oxide as the main component. The titanium nitride film is auburn (a color between purple and brown), and therefore has a high thermal reflectivity (low light transmission). By contrast, the titanium oxide film is white, and therefore has a low thermal reflectivity (high light transmission). As described previously, in apparatuses of the hot wall type, the thermal reflectivity of a by-product film is high where the color of the film is deep, such as brown, and the thermal reflectivity decreases as the color of the film is closer to white or transparent...". Therefore, since Mizuno teaches the same reformation process, Mizuno inherently teaches wherein the reformation process reduces thermal reflectivity of the by-product film.

In reference to claim 2, Mizuno inherently teaches wherein the reformation process is set to change color of the by-product film to white.

In reference to claim 3, Mizuno inherently teaches wherein the reformation process is set to change light transmission of the by-product film to be 70% or more.

In reference to claim 4, Mizuno teaches wherein the by-product film contains a metal nitride as a main component (Mizuno, column 7, lines 43 – 48).

In reference to claim 5, Mizuno teaches wherein the metal nitride is titanium nitride (Mizuno, column 7, lines 43 – 48).

In reference to claim 6, Mizuno teaches wherein the reforming gas is a gas that oxidizes the by-product film (Mizuno, column 7, lines 23 – 31 and column 9, lines 10 – 12).

In reference to claim 7, Mizuno teaches wherein the reforming gas comprises oxygen (Mizuno, column 9, lines 10 – 12).

In reference to claim 9, Mizuno teaches in a preferred embodiment of the invention wherein the reformation process and the semiconductor process are alternately repeated (Mizuno, column 7, lines 32 – 42).

In reference to claim 10, Mizuno teaches in a less preferred embodiment of the invention wherein the reformation process is performed after the semiconductor process is repeated a plurality of times without the reformation process (Mizuno, column 7, lines 32 – 42). Although not taught as a preferred embodiment, Mizuno teaches this embodiment nonetheless, and disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In *re Susi*, 169 USPQ 423 (CCPA 1971). "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In *re Gurley*, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493

U.S. 975 (1989). Even a teaching away from a claimed invention does not render the invention patentable. See *Celeritas Technologies Ltd. v. Rockwell International Corp.*, 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998), where the court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed." To further clarify, a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose, or even preferability of the invention for another purpose.

In reference to claim 11, Mizuno teaches wherein the semiconductor process forms a titanium nitride layer by a CVD process (Mizuno, column 7, lines 44 – 48).

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno ('629) as applied to claims 1-7 and 9-11 above, and further in view of Basceri et al. (2006/0244027 A1, hereinafter Basceri) and Koike et al. (U.S. 6,667,537 B1, hereinafter Koike).

Mizuno substantially teaches all aspects of the invention but fails to disclose the deposition temperature of the titanium nitride layer. However Basceri teaches a method



Art Unit: 2823

of forming titanium nitride layers including chemical vapor depositing titanium nitride at a temperature of about 600°C (Basceri [0071]). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Mizuno and Basceri to enable the deposition of the titanium nitride layer of Mizuno to be performed according to the teachings of Basceri because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of depositing the disclosed titanium nitride of Mizuno and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

The combined teachings of Mizuno and Basceri fail to disclose wherein the reformation process is performed at a reforming temperature higher than the process temperature. However, Koike teaches a method of manufacturing a semiconductor device including depositing a titanium nitride layer over a substrate at a temperature of 180°C (Koike, column 9, lines 62 – 67), and oxidizing said titanium nitride layer at a temperature of 400°C – 700°C (Koike, column 10, lines 50 – 55). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Mizuno and Koike to enable forming and oxidizing the titanium nitride layer of Mizuno according to the teachings of Koike because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of forming and oxidizing the disclosed titanium nitride layer of Mizuno and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Art Unit: 2823

11. Claims 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno ('629) in view of Basceri ('027) and Koike ('537).

In reference to claim 12, Mizuno teaches a method of forming a conductive layer over a substrate including the steps of controlling temperature of a first substrate to be at a process temperature inside a process container (Mizuno, column 8, lines 18 – 26), while supplying a process gas into the process container, thereby forming a metal nitride on the first substrate by a chemical vapor deposition (CVD) process, during which a metal nitride is formed on an inner surface of the process container (Mizuno, column 6, lines 20 – 37); subsequently to the CVD process and unload of the first substrate out of the process container, supplying a reforming gas into the process container, thereby subjecting the by-product film to a reformation process (Mizuno, column 6, lines 20 – 37); and subsequently to the reformation process, controlling temperature of a second substrate to be at the process temperature inside the process container, while supplying the process gas into the process container, thereby subjecting the second substrate to the CVD process (Mizuno, column 7, lines 32 – 43).

Mizuno fails to expressly disclose wherein said reformation process is set to reduce thermal reflectivity of the by-product film. However, Mizuno teaches wherein the reformation process comprises an oxidation of the titanium nitride by-product (Mizuno, column 7, lines 23 – 31). Furthermore, in page 22, lines 6 – 22 of the disclosed specification, applicants teach, "...The oxygen thus supplied into the inner tube 3 is activated by heat inside the process container 2, and oxidizes the by-product film deposited inside the process container 2 and containing titanium nitride as the main

component. As a consequence, the by-product film is reformed into a film containing titanium oxide as the main component. The titanium nitride film is auburn (a color between purple and brown), and therefore has a high thermal reflectivity (low light transmission). By contrast, the titanium oxide film is white, and therefore has a low thermal reflectivity (high light transmission). As described previously, in apparatuses of the hot wall type, the thermal reflectivity of a by-product film is high where the color of the film is deep, such as brown, and the thermal reflectivity decreases as the color of the film is closer to white or transparent...". Therefore, since Mizuno teaches the same reformation process, Mizuno inherently teaches wherein the reformation process reduces thermal reflectivity of the by-product film.

Mizuno substantially teaches all aspects of the invention but fails to disclose the deposition temperature of the titanium nitride layer. However Basceri teaches a method of forming titanium nitride layers including chemical vapor depositing titanium nitride at a temperature of about 600°C (Basceri [0071]). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Mizuno and Basceri to enable the deposition of the titanium nitride layer of Mizuno to be performed according to the teachings of Basceri because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of depositing the disclosed titanium nitride of Mizuno and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

The combined teachings of Mizuno and Basceri fail to disclose wherein the reformation process is performed at a reforming temperature higher than the process

Art Unit: 2823

temperature. However, Koike teaches a method of manufacturing a semiconductor device including depositing a titanium nitride layer over a substrate at a temperature of 180°C (Koike, column 9, lines 62 – 67), and oxidizing said titanium nitride layer at a temperature of 400°C – 700°C (Koike, column 10, lines 50 – 55). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Mizuno and Koike to enable forming and oxidizing the titanium nitride layer of Mizuno according to the teachings of Koike because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of forming and oxidizing the disclosed titanium nitride layer of Mizuno and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

In reference to claim 13, the combined teachings of Mizuno, Basceri and Koike teach wherein the reforming gas comprises oxygen (Mizuno, column 9, lines 10 – 12).

In reference to claims 14-16, the combined teachings of Mizuno, Basceri and Koike teach wherein the titanium nitride layer is deposited using titanium tetrachloride ( $\text{TiCl}_4$ ) and ammonia ( $\text{NH}_3$ ) (Basceri, [0071]).

12. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno ('629) in view of Basceri ('027) and Koike ('537) as applied to claims 12-16 above, and further in view of the applicants admitted prior art (hereinafter the prior art).

The combined teachings of Mizuno, Basceri and Koike substantially teach all aspects of the invention but fail to disclose wherein the process container is configured to accommodate a plurality of target substrates at intervals in a vertical direction, the

Art Unit: 2823

target substrates are heated by a heater disposed around the process container, and the by-product film is present between the target substrates and the heater.

However, the prior art (Fig.7) teaches forming a titanium nitride layer in a process container, wherein said process container configured to accommodate a plurality of target substrates (54) at intervals in a vertical direction, the target substrates (54) are heated by a heater (53) disposed around the process container, and the by-product film is present between the target substrates and the heater (prior art, page 2, line 6 – page 4. line 7).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Mizuno, Basceri and Koike with the prior art to enable the formation of the titanium nitride layer to be performed according to the teachings of prior art because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of forming the disclosed titanium nitride layer and art recognized suitability for an intended purpose has been recognized to be motivation to combine (MPEP 2144.07), and because this would enable the formation of titanium nitride layers in a plurality of wafers all together (prior art, page 2, lines 1 – 3).

### ***Conclusion***

13. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.

Art Unit: 2823


14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

15. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at

<http://www.uspto.gov/web/info/2800.htm>.

Julio J. Maldonado  
Patent Examiner  
Art Unit 2823

Julio J. Maldonado  
June 15, 2007

  
George Fourson  
Primary Examiner